

# Generative AI Discovers Record-Breaking Broadband Light Absorbers

## Scientific Achievement

With aid of AI, first experimental demonstration of a broadband (>1000 nm bandwidth) absorber above 98% absorption through the inverse design of an epsilon-near-zero multilayer thin film stack.

### Physics-Informed Generative Modeling

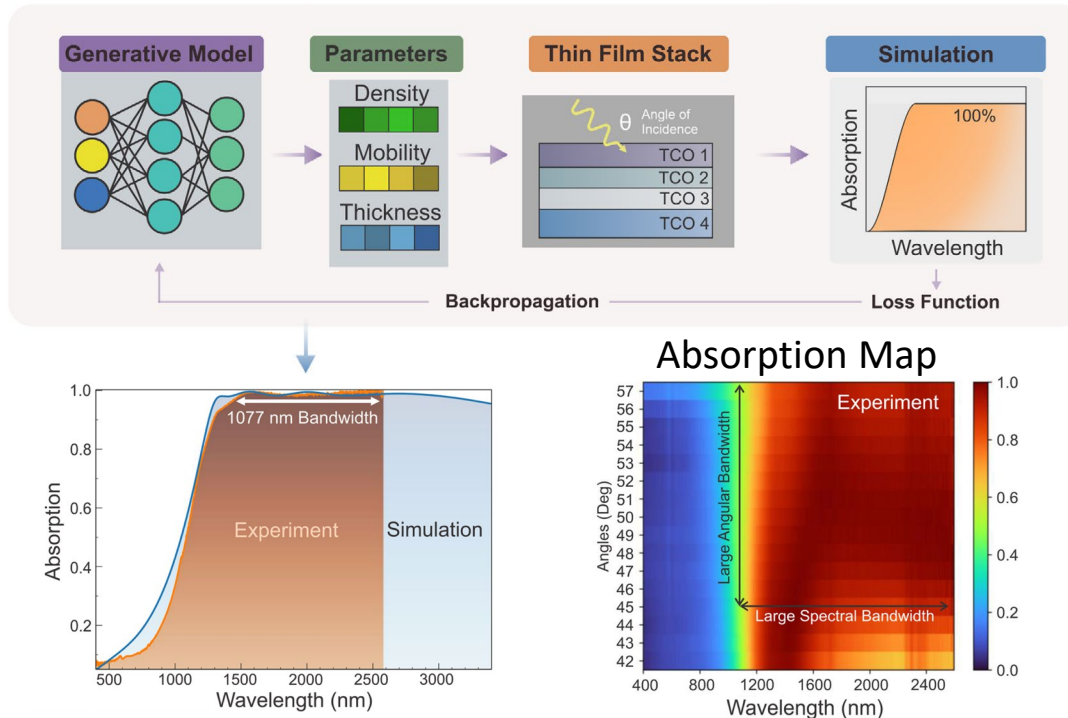


**Figure:** Generative AI design of an ultra-broadband absorber. A neural network proposes the material properties and thickness of each layer, a physics model simulates the resulting absorption, and feedback from the simulation trains the network. Experimental measurements match closely with simulation.

Work was performed, in part, at the Center for Integrated Nanotechnologies.

## Significance and Impact

AI-enabled rapid discovery and engineering of on-demand broadband metamaterials have profound technological implications for energy harvesting, sensing, and imaging.

## Research Details

- A generative neural network explores a vast design space of multilayer epsilon-near-zero films.
- Physics-in-the-loop simulations in the training process removes the need for large datasets.
- AI-designed films were fabricated and absorb nearly all light across a broad infrared band.

Dang, D.; Salib, M.; Dang, Q.; Gurung, S.; Calixto, J.; Zhou, X.; Love, S.; Akbar, M.; Anopchenko, A.; Kort-Kamp, W. J. M.; Lee, H. W. H. Generative AI-Enabled Discovery and Experimental Demonstration of Ultra-Broadband Epsilon-Near-Zero Perfect Absorbers. Adv. Sci. 2026, e77966. DOI: 10.1002/advs.77966.